

Scratching the Surface: Third Grade  
Programming  
TJHSST Senior Research Project  
Project Proposal  
Computer Systems Lab 2009-2010

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## **1 Definition**

The goal of this project is to successfully mentor elementary school students in the use of various techniques that Scratch programming allows. These techniques can be as relevant as technology and math, or go as far as teaching literary topics. This project/mentorship will involve traveling to Cardinal Forest Elementary School for an hour every Thursday to help teach kids in the basics of using Scratch.

## **2 Purpose and Scope of Research**

The goal of this project is to successfully mentor elementary school students in the use of various techniques that Scratch programming allows. These techniques can be as relevant as technology and math, or go as far as teaching literary topics. This project/mentorship will involve traveling to Cardinal Forest Elementary School for an hour every Thursday to help teach kids in the basics of using Scratch. It will also involve designing effect lesson plans that will present information in a manner that will be both fun and informative to the third grade students, and determining which approach works best. There

have been dozens of research projects done in this area, ranging from teaching students to teaching the teachers. Almost every research project has found Scratch and other similar programs to be extremely effective at teaching students topics in every branch of education, from math to literature.

### **3 Background**

In the previous two years, students have already done several research projects in this area. Jessica and Crystal worked at Cardinal Forest last year, and helped students learn the mathematical techniques that the students will need to know. This will mainly include the coordinate plane, which will require us to first demonstrate the use of negative numbers. The previous students spent the first two months teaching these topics in order for the students to appropriately use the Scratch program. After this, they spent several months working on a basic program involving a snowman in order to practically apply these skills in the Scratch program. The last part of the class was devoted to individual games of the student's choice, with the help of Jessica and Crystal to mentor the students in any other aspects of the language they needed to know.

The focus of the first year was to determine if Scratch could be taught to elementary students successfully. The methods listed above will help with the current project, which involves the various designs of lesson plans and how they affect how the students learn the material in Scratch. The purpose of this project has changed from the previous two years, as we have discovered that elementary school students can learn Scratch and program with it, but now we are attempting to find out which of the different lesson plans work with the most success.

### **4 Procedure and Methodology**

Scratch is a visually based programming application developed by MIT that allows users to click and drag simple, color-coded sections of code into the script area. Through the use of these codes and "sprites", the visual aspect of the program, a user may make simple games, stories, and other programs. Scratch is different from Alice in one major, easily noticeable aspect: Alice is a 3D-based program, requiring students to not only understand a coordinate

plane, but also the third, or z, dimension. This is normally not introduced to students until eighth or ninth grade. Scratch is only in two dimensions, and will therefore be much easier to teach kindergarten through third grade students. With the coordinate plane comes the use of negative numbers, which will have to be taught over the course of several sessions. Also involved will be the use of degrees and angles to calculate directions the sprites will be moving in. All this information has to be taught and understood before any actual programs are made. The first programs will involve basic movement around the screen, including directions and rotation. Later on, lessons will focus on Sprites interacting with one another and the background. This will hopefully evolve into a final project at the end of the year, involving some sort of game the kids will create.

## **5 Expected Results**

If all goes well, the project will end at the end of the year with the students completing a relatively complex final project. The students will have an advanced understanding of the coordinate plan, as well as a more complete sense of the SOL topics we focus on throughout the year. The students will also have an outlet for creativity and restlessness, since the class requires a lot of innovation and outside-the-box thinking. Since programming is not often taught to elementary students, this project will hopefully spread to other schools as well, allowing students to have a broader base in programming before they reach high school. Students with an introduction into technology early on will probably develop more interest in the area, and hopefully pursue this interest in their high school career.